World Satellite Update™

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Satellite Newsflash: Europe, Africa & the Middle East

Super Channel To Begin Operations

Beginning January 30 1987, Super Channel will begin transmitting its 24-hour satellite television service to cable TV systems in western Europe. The result of an agreement between the UK Independent Television Companies and the Virgin Group, Super Channel will expand upon the successful Music Box service which already reaches more than 5 million homes in 12 countries by adding a variety of information and entertainment programs. While the youth audience will continue to enjoy Music Box videos from 4 to 6 p.m. and 1 to 7 a.m. each day, daytime programs for children will be offered as well as news, documentaries, sports events, dramatic presentations and family entertainment. (For further information contact Maria Morgan at Super Channel. Telephone: 01 631 5050).

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European Version of MTV Announced

A joint venture between Robert Maxwell's Mirror Group Newspapers, British Telecom and MTV Networks USA (a unit of Viacom International Inc.), has announced that a European version of MTV: Music Television--a 24-hour rock 'n roll video music network--will begin operations later this year. MTV Europe will have its headquarters in London, with eventual studio and corporate expansion to major cities elsewhere in Europe. (For further information, contact Paul Quade, Mirror Group Newspapers in London, telephone: 01 822-3646).

Iran & Gabon Begin Intelsat Satellite TV Transmissions

As reported in the November, 1986 issue of *World Satellite Update*, Iran has acquired three Ku-band spot beam transponders on the Intelsat V satellite at 63° degrees east longitude and Gabon has purchased an eastern hemispheric beam transponder on the Intelsat V satellite stationed at 1° west longitude. In early January, Iran was observed transmitting television programming via east spot beam transponder 73. Iranian video transmissions are in the SECAM video standard with a center frequency of 11.155 GHz. A 6.2 MHz audio subcarrier is also being used. Reception of the service from as far away as the United Kingdom is possible when antennas 4.5 meters in diameter or larger are used.

Gabon has also begun to use its C-band transponder for the transmission of video programming. The TV transmissions take place on a center frequency of 3.710 GHz and are in the half-transponder format. Like Iran, Gabon also is using the SECAM video standard and a 6.2 MHz audio subcarrier. To date, Gabon's TV feeds have been intermittent. In addition to transmitting programs produced in Gabon, the

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transponder is also being used to transmit various French television programming. The power level of the transponder is backed off by several dB. Estimated EIRP in the United Kingdom is 24 dBW. Reception can be obtained from anywhere in Western Europe and Africa.

New Ku-band Services on Intelsat V F2

Israel has acquired two Ku-band transponders aboard Intelsat V F2 at 1° west longitude. The capacity will be used to transmit TV programs to cable systems in Israel. Two TV services, Israel's Program B and a pay TV venture, will begin operations this year via the satellite's east spot beam. Services will be transmitted in the full transponder format in the PAL video standard. One of the TV services will use the center frequency of 11.176 GHz.

The New World Channel, a religious program service of Norway's European Broadcasting Network (EBN), has moved from the Eutelsat I F1 transponder which it previously shared with TV-5 and Worldnet, to the Intelsat V F2 spacecraft at 1° west longitude. Video is transmitted with a center frequency of 11.680 GHz and audio by means of a 6.6 MHz subcarrier. Using the satellite's west Ku-band spot beam, the New World Channel joins SVT-1 and SVT-2, Swedish TV services which are beamed to cable TV systems in Norway. The move to the new satellite will allow the New World Channel to expand its services to 24 hours a day.

Intelsat Board of Governors Raises Ku-band Transponder Prices, Recommends Panamsat Coordination Plan

At the recently-held 69th Intelsat Board of Governors meeting, the rates for Intelsat V Ku-band spot beam transponder were raised from $ 5.3 million to $ 5.7 million. By comparison, most Intelsat C-band sales rates were lowered. As reported in our survey of Intelsat Ku-band assignments in the November issue of **World Satellite Update,** Intelsat has already sold or leased most spare Ku-band capacity in their system. Various U.S. sources have reported that Intelsat Signatory Comsat General may negotiate with IBM for the possible purchase of the SBS VI satellite owned by the Satellite Transponder Leasing Corporation, a subsidiary of IBM. Following purchase, SBS VI could be turned over to Intelsat, providing the international satellite consortium with additional Ku-band capacity for sale or lease to member nations. Already under construction, SBS VI is scheduled for launch by Ariane in 1989.

The Intelsat Board of Governors also recommended that Intelsat permit the launch of Panamsat's *Simon Bolivar* satellite, a move that for the first time would establish a separate international satellite carrier that would compete with Intelsat in the Atlantic Ocean region. An extraordinary session of the Intelsat Assembly of Parties to be held in March of this year must formally approve the Panamsat coordination.

If formally approved by the Assembly of Parties, Panamsat will be allowed to establish five C-band transponders to be used for a U.S./Peru telecommunications link. Future consultations will be necessary if the other thirteen C-band and six Ku-band transponders on *Simon Bolivar* are brought into use. The extraordinary session of the Assembly of Parties will also select a new Director General to replace Richard Colino who was fired following allegations of financial impropriety.

Telecom I F2 Airs New TV Service

For three hours daily, Telecom I F2 is now transmitting a program service for children between the ages of 4 and 13 years. Called "Canal 'J,"' the new service is carried on Ku-band transponder R2 with a center frequency of 12.564 GHz. So far, video transmissions have been in the PAL format. A 5.8 MHz audio subcarrier is also used. The service airs advertising and also charges cable operators a monthly fee for each subscriber viewing the service. Canal J is a product of the Hachette Television Group.

Oman Switches to Arabsat

Oman Television (Dhofar), previously available via Intelsat V F7 at 66° east lonitude, was tranferred to the Arabsat F2 satellite at 26° east longitude in the fall of 1986. Using left-hand circular polarization, the latest Arabsat TV service is now transmitted on transponder 20 with a center frequency of 4.063 MHz. The sound portion of the TV signal is transmitted by SCPC techniques on a center frequency of 4.07845 GHz. Due to a back-off of approximately -8 dB, Omani Television has a beam center EIRP of about 27 or 28 dBW. Broadcasting in the PAL video format, Omani TV begins its programming day at 11:00 GMT, except for Fridays when it begins operations at an earlier time.

Germany Expands Intelsat Ku-band Satellite Transmissions

The **3-SAT** program service transmitted by the Eutelsat I F1 satellite is now duplicated on the west

spot beam (transponder 61 [1W]) of Intelsat VA F12, with a center frequency of 10.975 GHz. The audio portion of the TV programming is carried by a 6.65 MHz subcarrier. On November 15 1986, a new service known as **Eureka TV** began daily four-hour transmissions of films and other programs via Intelsat VA F12's west spot beam transponder 69 [5W] with an audio subcarrier of 6.65 MHz.

Test transmissions of a new digital audio delivery system developed in cooperation with Telefunken, Phillips, Blaupunkt and Sony is also taking place through the Intelsat VA F12 spacecraft. Known as **Digitaltron**, the new service will eventually be moved to the Germany's TV-SAT DBS satellite following its launch in late 1987. At the present time, transponder 61 [1W] is being used to transmit up to 16 digital carriers within a 15 to 18 MHz bandwidth centered on 10.975 GHz. The digital channels now transmit Pop and Jazz music programs, the Träger and Hörspiel talk networks, and 1 kHz and 400 Hz test tones.

Satellite Newsflash: The Americas

Live Soviet TV to Air on U.S. Cable Stations This March

The Soviet State Committee for Television and Radio Broadcasting (Gostelradio) has announced an unprecedented TV exchange which will permit the full broadcast day of its domestic television network to be seen live on five U.S. cable systems for one week this March. Television feeds will be provided by the Soviet "Molniya" series of polar orbiting spacecraft. Conceived by Orbita Technologies Corporation chairman Ken Schaffer, Americans will see the first U.S. distribution of Soviet programming at the same time that Soviet citizens view it. Manhattan Cable Television of New York City has already announced its participation in the event. At the time of publication, Orbita Technologies was selecting four other cable TV systems at locations around the U.S. for participation in the project. (for further information contact Ken Schaffer, Orbita Technologies Corporation, 21 West 58th Street, New York, NY 10019. Telephone: 212-371-2335.

Viacom International Acquires Telstar 303 Transponders

On October 30 1986, AT&T filed documents before the Federal Communications Commission which indicated that Viacom International Inc. had leased a total of 21 C-band transponders aboard Telstar 303 at 125° west longitude from AT&T for more than $243 million. Under AT&T's **Skynet Bulk Transponder Service**, the Viacom Networks Group of cable program services, which includes east & west coast feeds of Showtime the Movie Channel, and Nickelodeon, MTV: Music Television, and Video Hits 1 (VH-1), as well as non-affiliated cable program services, will all be transmitted exclusively by the Telstar 303 satellite. AT&T, owner of the Telstar series of communications spacecraft, was observed in early January running video tests on Telstar 303 transponders 1, 2, 5, 9, 11 & 21--all previously assigned for the transmission of voice and data traffic.

One potential problem with the switch of cable TV program services to Telstar 303 is that the AT&T satellite can only provide Hawaiian coverage by means of selected transponders. Of course, Satcom F4R could not transmit to Hawaii whatsoever and Satcom F3R's Hawaiian coverage was limited to ten selected transponders. Galaxy 1 provides complete coverage of Hawaii via all 12 horizontally-polarized transponders. Of the six Telstar 303 transponders under test in early January, only transponder 2 was capable of Hawaiian as well as CONUS coverage. Spot beam coverage of Puerto Rico can be accomplished via other Telstar 303 transponders, however.(See the Telstar 303 entry on page 393 of the **World Satellite Almanac** for a complete list.) With a total of 21 transponders available, Viacom will be able to selectively assign services to the most appropriate channels.

Viacom's cable TV program services will move to Telstar 303 in the near future, with channels simulcast on their original Galaxy and Satcom satellite transponders during an initial transfer period that is slated to end on May 14, 1987. The lengthy change over period will give cable and SMATV operators ample opportunity to realign their satellite antennas onto the latest cable TV bird. According to the filing before the FCC, AT&T intends to provide satellite antennas to those cable operators that cannot reposition their dishes onto Telstar due to conflicting commitments for other services carried by Satcom F3R, Satcom F4R or Galaxy 1.

New Superstations From Denver Air Via Satcom F1R

Netlink USA is now using four Satcom F1R transponders to uplink four broadcast stations out of Denver Colorodo, with a fifth Denver station to be added to the package in the near future. These unwitting Denver superstations will eventually be scrambled so that they can be marketed to those

rural cable TV systems and home satellite TV viewers that are located in areas beyond the reach of terrestrially transmitted affiliates of the major networks. As of January 5 1987, fifty cable TV systems with a combined subscriber base of 150,000 were subscribing to Netlink USA's services.

Netlink USA Transponder Assignments on Satcom F1R
Tr.# 2 Superstation KWGN (Independent) Denver
Tr.# 6 Superstation KRMA (PBS) Denver
Tr.#20 Superstation KCNC (NBC) Denver
Tr.#22 Superstation KMGH (CBS) Denver
Tr.#24 Superstation KUSA (ABC) Denver

HDTV Experiments Take Place in Washington D.C.

From January 7 to January 14 1987, experimental High Definition Television (HDTV) transmissions took place in Washington D.C. Sponsored by the **National Association of Broadcasters** and the **Association of Maximum Service Telecasters**, the HDTV transmissions took place via UHF channels 58 and 59. The special HDTV service was temporarily assigned the call sign WWHD-TV by the FCC. Special HDTV receivers were installed at the offices of the Federal Communications Commission and at selected sites throughout the U.S. Capitol. On the evening of January 21 1987, a special demonstration for members of the U.S. Congress and their staffs is scheduled to be held at the Senate Caucus Room.

The main designer of the experimental HDTV system is NHK, Japan's national broadcasting company. The Japanese HDTV system transmits 1,125 lines in each video image, more than twice the number of lines as traditional NTSC. The innovative HDTV system also has an aspect ratio of 16:9 which is far closer to cinematic productions than today's conventional television transmissions.

Due to its superior quality, HDTV has often been touted as the satellite TV transmission standard of the future. During our recent visit to Tokyo, NHK representatives indicated that they intend to transmit an HDTV program service following the successful launch of Japan's next generation of DBS satellites in 1990. (For further information about the experimental HDTV broadcasts, contact Loretta Eucello at the national Association of Broadcasters. Telephone: 202-429-5350.)

RCA and HBO Announce Ku-band Dish Give-Away

In an effort to promote the advantages of Ku-band satellite transmissions to the U.S. cable TV community, HBO and RCA have announced a plan to give qualified cable TV operators free Ku-band satellite systems. This Ku-band dish give-away is patterned on RCA's successful marketing of its Satcom K2 satellite to the nation's broadcasters. The move will not only create an immediate market for its Satcom K2 bird, but also pave the way for the introduction of Satcom K3 in 1989, a satellite under the ownership of the HBO/RCA joint venture known as **Crimson Satellite Associates**. RCA gave more than 600 American broadcast TV stations free dishes in 1985 and 1986. Under the new plan, more than 3,000 cable TV systems will be able to acquire 12 GHz terminals free of cost. Both HBO and RCA will be providing cable operators with their choice of electronic packages manufactured by General Instrument, the Sony Corporation or Scientific Atlanta. Depending on location, RCA will provide cable operators with 3-meter antennas manufactured by Channel Master or 3.7-meter antennas constructed by Antennas For Communicaitons, while HBO will supply 3.1- or 3.7-meter dishes from Vertex.

Satellite Newsflash: The Pacific

Pan-Am Pacific to Launch Former Westar 6 Satellite Via Chinese Rocket

The Pan-Am Pacific Satellite Corporation, a joint venture of Johnson Geneva Ltd. and the Pan Am Corporation, has negotiated a launch reservation with the People's Republic of China for the deployment in May of 1988 of a wayward telecommunications satellite retrieved by NASA's Discovery Space Shuttle in 1984. Pan Am Pacific is just one of several companies (Dominion Video, Terasat, and Western Union) which recently made launch reservations with the People's Republic of China. (See page 11 in this issue).

Pan Am acquired the former Westar 6--now dubbed Pacific Star 1--satellite from a group of insurance underwriters in September of 1986 for approximately $ 20 million. Hughes Aircraft will redesign the antenna payload of Westar 6 to provide optimum coverage of the Pacific Basin. Pan-Am Pacific intends to register an orbital assignment with the International Frequency Registration Board of the International Telecommunication Union through one of the Pacific Basin nations.

Exploring The Japanese Domestic Satellite Network

A major deficiency of the original **World Satellite Almanac** was that minimal information was persented on various existing and planned Japanese domestic satellites. Prior to publishing the first edition of the Almanac, we had excellent channels of communication with many satellite corporations in Europe and North America, but little or no contact with corresponding groups in the Far East. To remedy this shortcoming, *World Satellite Update* recently visited Japan and met with representatives of NHK as well as other parties participating in the development of future Japanese domestic satellites.

Our intension was to gather information for the next edition of the **World Satellite Almanac** which will be published in May of this year. This issue of *World Satellite Update* presents an overview of the Japanese domestic satellite network, so that those readers who purchased the original Almanac can obtain a more complete picture of satellite developments in the Far East.

150° & 154° East

JCSat I & I [Japan], 154 and 158 Degrees East

In June of 1986, the Japanese government granted a license to Japan Communications Satellite Co. (JCSC)--a joint venture between Hughes Aircraft (30%), the Mitsui Trading Corp. (30%), and C. Itoh & Co. Ltd.(40%)--to construct, launch and operate a domestic satellite system for Japan. Operating within the Ku-band frequency spectrum, the JCSat spacecraft design is based on the Hughes HS-393 spin-stabilized spacecraft bus. Each of the two operational JCSat satellites will carry 32 27-MHz-wide transponders. Transmitting via 20-watt TWTAs, the Japanese communications satellites will generate a minimum EIRP of 50 dBW over all four main islands of Japan. The JCSat birds are scheduled to be launched via an Ariane rocket in 1988 and 1990. Orbital assignments of 150 and 154 degrees east longitude were awarded following coordination between the telecommunications authorities of Japan and the International Frequency Registration Board (IFRB). Ten JCSat transponders already have been leased by the Nippon Telegraph and Telephone Corporation (NTT) which presently operates via four Ka-band and two C-band transponders aboard Japan's CS-2A satellite.

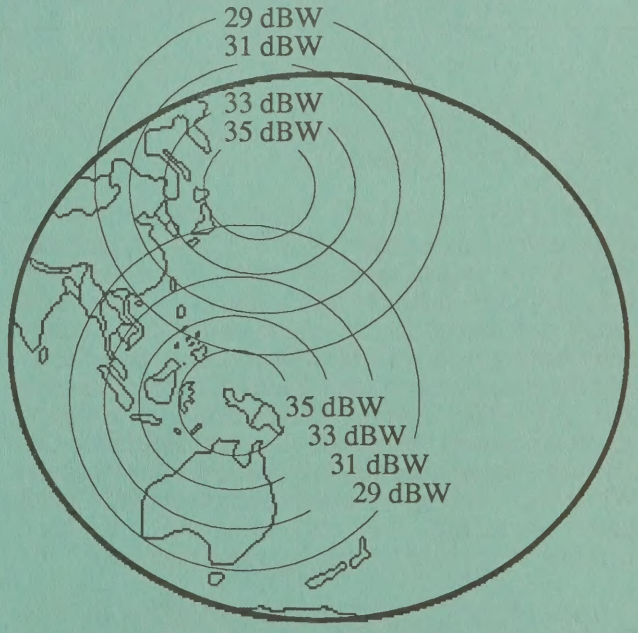
150° East

ETS V & ETS VI [Japan], 150 Degrees East

Japan's Engineering Test Satellite is an experimental mobile satellite telecommunications spacecraft that uses L-band frequencies for the mobile-to-satellite and satellite-to-mobile links and C-band frequencies for the feeder links. The ETS-V satellite will provide a test bed for the evaluation of land mobile, aeronautical, maritime and distress communications applications within the Pacific Ocean region. The launch of ETS-V will also permit the Japanese to directly evaluate the performance of a new three-axis stabilization satellite bus developed by NASDA, the National Space Development Agency of Japan.

The ETS-V program will aid in the development of mobile transceivers and small-aperture high-gain antennas that compensate for the multipath fading problem encountered by mobile satellite users. Scheduled experiments also include the evaluation of various digital encoding technicques for voice communications purposes.

The ETS-V satellite will be a geostationary satellite stationed at 150° east longitude. NASDA is scheduled to launch ETS-V this summer from Japan's Tanegashima Space Center. A follow-up satellite, ETS-VI, is scheduled for deployment in 1992. ETS-VI will be a heavier three-axis stabilized spacecraft carrying an even more advanced telecommunications payload than ETS-V.



ETS-V L-band patterns at 1.544 GHz

ETS-V at a Glance

Operational History

Launch Date(s):	Summer, 1987
Launch Vehicle:	NASDA H1 rocket
Orbital Assignment:	150° East longitude
Status:	Experimental mobile communications satellite
Design Life:	1.5 years

Communications Payload

Frequency Band(s):	
Mobile Links:	Receive: 1.642~1.650 GHz
	Transmit: 1.5405~1.548 GHz
Feeder Links:	Receive: 5.9495~5.9715 GHz
	Transmit: 5.2195~5.2415 GHz
Antenna Coverage:	Spot beam coverage
Antenna Gain (in dBi):	L-band: 24 dBi
	C-band: 19 dBi
Signal Power:	L-band: 20 watt GaAs FET

Spacecraft

Satellite Type:	NASDA three-axis stabilized bus
Launch Mass:	550kg (1210 lbs)
Electrical Power:	800 watts at end of life
Telemetry Beacons:	2.100 & 2.200 GHz
Command Beacon:	6.400 & 5.100 GHz

132° & 136° East

CS-2A & CS-2B [Japan], 132° & 136° East

On February 4 1983, Japan's first commercial communications satellite (CS-2A) was carried into orbit by a Japanese N-II rocket launched from NASDA's Tanegashima Space Center. CS-2A is the direct descendant of an experimental CS satellite deployed by Japan in 1977. Operating in both the C- and Ka- satellite frequency bands, CS-2A represents the world's first commercial Ka-band communications spacecraft. On August 5 1983, CS-2B was successfully deployed as an in-orbit spare. While the satellites' C-band footprints cover all of Japan including the remote islands, Ka-band coverage is restricted to the Japanese mainland.

Located at 132° and 136° east longitude, CS-2A & CS-2B are fully-operational Japanese domestic satellites that serve as an emergency back-up link to the Japanese terrestrial telecommunication system in the event of a natural disaster or other emergency, and supply direct dialing access to the mainland's public telephone network from the remote Ogasawara islands where conventional undersea cables or terrestrial microwave facilities have not been previously established. The system is also used to handle excess traffic between major regional centers whenever the existing terrestrial telephone system is overloaded due to peak demand. A TDMA system using BPSK at a rate of 65 Mb/s is utilized at Ka band, while down at C band a TDMA system using QPSK at a rate of 100 Mb/s is employed. The Nippon Telegraph and Telephone Corporation (NTT) presently utilizes four of the six Ka-band and both C-band transponders on CS-2A. When the occasion warrants it, transportable earth stations are used to transmit live TV feeds from remote sites to network

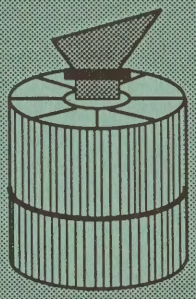
CS-2A & CS-2B at a Glance

Operational History

Orbital Assignment(s):	CS-2A: 132 degrees East CS-2B: 136 degrees East
Launch Date(s):	CS-2A: February 4, 1983 CS-2B: August 5, 1983
Launch Vehicle(s):	CS-2A: NASDA N-II rocket CS-2B: NASDA N-II rocket
Status:	CS-2A: primary satellite CS-2B: in-orbit spare
Design Life:	Five years

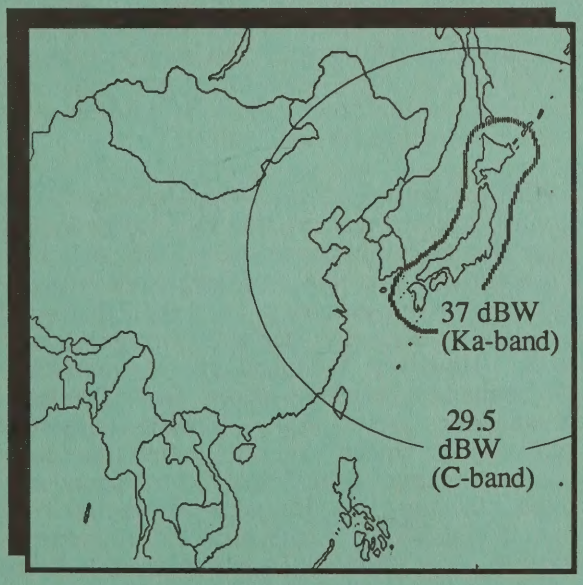
Communications Payload

Frequency Band(s):	Receive: 5.925~6.425 GHz 27.5~29.25 GHz Transmit: 3.7~4.2 GHz 17.75~19.45 GHz
Channels:	2 C-band & 6 Ka-band
Polarization:	Circular
Bandwidth:	C-band: 180 MHz Ka-band: 130 MHz
Signal Power (EIRP):	C-band: 29.5 dBW Ka-band: 37 dBW
TWTA Power:	5 watts



Spacecraft

Satellite Type:	Spin stabilized
Initial On-Station Weight	350 kg
Maximum (deployed) Dimensions:	2.184 m in diameter & 3.288 m in height
Electrical Power:	500 watts



studios via the CS-2 satellites. The spare CS-2B satellite also supports new Japanese satellite digital communications services (SDCSs).

Second-generation CS-3 satellites are scheduled to be launched by NASDA in early and mid 1988; these satellites will replace CS-2A and CS-2B. Now under construction by Mitsubishi Electric Corporation, CS-3 satellites will be the first in the world to use Gallium-Arsenide (GaAs) solar cells that generate 150% of the amount of electricity produced by conventional silicon wafers. The CS-3A satellite will also provide two C-band and ten Ka-band transponders, for a combined capacity of more than 6,000 voice channels.

C- & Ka-band Spot-Beam Coverage from Japan's CS-2A satellite at 132° east longitude.

CS-2A & CS-2B
Channel Assignment Plan

Tr.#	Downlink Freq.
1	3775 MHz
2	4020 MHz
3	17875 MHz
4	18155 MHz
5	18435 MHz
6	18715 MHz
7	18995 MHz
8	19275 MHz

Telemetry Beacon(s): 2286.5 MHz
3950 MHz
19450 MHz

124 & 128° East

SpaceSat I & II [Japan], 124 & 128 Degrees East

Space Communications Corporation--a joint venture between Mitsubishi Trading Corporation (25%), Mitsubishi Electric Corp. (20%), Mitsubishi Heavy Industries (10%), Mitsubishi Bank, and other minority shareholders--has obtained approval from the Japanese telecommunications authority to construct, deploy and operate a private domestic satellite system for Japan. One satellite will serve as the operational spacecraft while the other will be an in-orbit spare. The SpaceSat satellite design will be based on the Intelsat V & VA spacecraft bus previously manufactured by Ford Aerospace for the Intelsat organization. The satellites are scheduled to be launched via Ariane 4 rockets in 1988 and 1989.

Each SpaceSat bird will carry 12 Ku-band and 23 Ka-band transponders. Thirteen of the Ka-band transponders will be powered by 25-watt TWTAs, creating a powerful spot beam about 124 miles (200 km) in diameter. The other ten Ka-band transponders carried by each satellite will be powered by 10-watt TWTAs and deliver nationwide coverage of the islands of Japan. Ka-band satellites have an advantage in Japan due to the fact that both the C- and Ku-band frequency ranges are already used for terrestrial communications purposes.

The SCC satellites will weigh 1400 kg (3,086 lbs) each. The SpaceSat Ku-band transponders will be powered by 15-watt TWTAs. The Space Communications Corporation has obtained orbital assignments of 124 and 128 degrees east longitude by the International Frequency Registration Board.

110° East

Yuri BS-2A & Yuri BS-2B [Japan], 110 Degrees East

On April 7 1978, Japan launched BSE, the world's first Direct Broadcast Satellite. Nicknamed "Yuri," (Japanese for lily), BSE served as a testing ground for various experiments in high definition television (HDTV) and demonstrated satellite TV reception using small-aperture antennas with diameters ranging from 1 to 1.6 meters. For a three-year period, BSE served as an effective demonstration of DBS technology. However, the early failure all three high-power transponders aboard BSE was a dissapointment. An investigation into the untimely end of BSE postulated that the early failure was due to arcing inside the 100-watt TWTA's high-voltage power supplies. Contractors redesigned the TWTA power supply so that subsequent BS flight models would not experience the same problems.

Encouraged by the overall results of the two-year BSE experimental program, Japan moved to develop a commercial successor to its BSE satellite. Plans called for the BS-2 series of satellites to transmit the telvision signals of Nippon Hoso Kyokai (NHK), Japan's national broadcasting company, to the more than 400,000 Japanese households which could not receive coverage by terrestrial means. Since most of the unserved households were located in isolated rural areas, mountainous regions or on remote islands, it was determined that only a satellite transmission could provide the comprehensive coverage required. With their deployment in 1984 and 1986, the BS-2A and BS-2B spacecraft became the first direct broadcast satellites to fully conform with the DBS specifications laid down at the World Administrative Radio Conference (WARC) of 1977.

With the launch of BS-2A on January 23 1984, communications planners the world over looked to Japan for an indication of how DBS technolgogy might revolutionize telecommunications in their own countries. By February 15 1984, the satellite arrived at its assigned place within the geostationary orbit. However, technical snafus continued to plague the Japanese DBS efforts. One of three DBS transponders aboard BS-2A failed only weeks following its launch. Within the first three months of operation, two of the three DBS transponders had failed, forcing the Japanese to reclassify the commercial BS-2A spacecraft as an experimental satellite. The third BS-2A transponder has been in

almost continuous operation since May 12 1984, carrying the main television program service for NHK.

The technical consensus has been that the failure of the BS-2A transponders was due to a temperature increase inside the 100-watt TWTAs which melted the tube's interal insulation. To prevent the BS-2B satellite from suffering from the same problem that afflicted its predecessors, several improvements were made to BS-2B's TWTAs, including alterations to the filament voltage supply and the addition of a copper heat-sink for conduction cooling of the TWTA itself. Since its launch in February of 1986, BS-2B's transponders have all functioned normally. However, there was a failure of the satellite's primary attitude control system; Japanese engineers are now controlling the satellite by means of an on-board back up attitude control system.

Both BS-2A and BS-2B use a phased feed horn array to synthesize the satellites' unique footprint. The resulting shaped beam concentrates the 11 GHz DBS signal primarily over the islands of Japan. Locations on the main island receive a minimum of 54 dBW, allowing reception with antennas 70 cm in diameter. On the islands of Okanawa and Ogasawara, the available signal level is reduced to a minimum of 45 dBW of signal, requiring the use of antennas with an aperture of 1.8 m or larger. Reception of BS-2A & BS-2B from locations in South Korea and Taiwan is also possible if earth station antennas with a diameter of 3 meters or more are employed. Each satellite carries two operational transponders (WARC-BS-77 Trs. 11 and 15) and one redundant back up transponder. At the time of publication, each satellite was supplying one operational transponder, with BS-2B providing two back-up transponders in the event of any further failures.

BS-2A programming is uplinked via an eight-meter earth station located on the roof of the NHK Broadcast Center in Tokyo. In the event of a natural disaster or other emergency, NHK possesses a back-up earth station in Osaka and transportable earth stations that could also uplink signals to the satellites. At the present time, up to 90% of the programming carried by the BS-2 satellites is identical to the terrestrial General TV transmissions of NHK. Due to NHK's widespread terrestrial coverage, there is at present little interest in satellite TV outside of the remote islands. As of November 1986, NHK was negotiating with the government for permission to offer substantially different programming on the second BS-2 channel than what the general public now receives through terrestrial transmitters. Utilizing pulse code modulation (PCM)† techniques, both NHK DBS channels transmit the sound portion of the TV programming via a 5.727272 MHz subcarrier.

By 1989, Japan will deploy its BS-3 satellite in order to continue the satellite transmission of television programming to remote areas in Japan. The space platform will be based on the RCA 4000 series design used for the U.S. Satcom K1 & K2 satellites. Each BS-3 spacecraft will have the capability of simultaneously transmitting 3 color TV channels. Japan's NEC will work with RCA to manufacture portions of the satellite, including the 100-watt TWTAs. Once BS-3 has been successfully deployed, NHK will operate two of the three DBS channels, while the third channel will be programmed by a consortium of regional Japanese TV operators.

Yuri BS-2A & BS-2B Channel Assignment Plan

Tr.#	Pol.	BW	Uplink/Downlink
11	RHCP	27 MHz	11.91928 GHz
15	RHCP	27 MHz	11.99600 GHz

†Pulse Code Modulation Parameters

Audio Signal Bandwidth:
Type A: 15 kHz Type B: 20kHz
Sampling Frequency:
Type A: 32 kHz Type B: 48 kHz
Quantizing & Compounding:
Type A: 14/10 bit Type B: 16 bit
Number of Frame Bit:
2.048 Mb/s ± 10 b/s

Yuri (BS-2A & BS-2B) at a Glance

Operational History

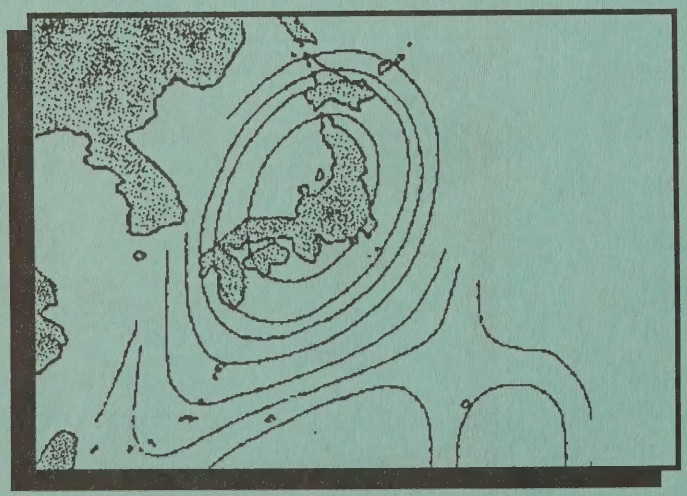
Orbital Assignment:	110° East
Launch Date(s):	BS-2A: January 23, 1984 BS-2B: February 12, 1986
Launch Vehicle:	NASDA N-II rocket
Status:	BS-2A: Experimental satellite with one active transponder. BS-2B: Operational satellite
Design Life:	Five years

Communications Payload

Frequency Band(s):	Receive: 14.2~14.3 GHz Transmit: 11.9~12.0 GHz
Channels:	2
Polarization:	Right Hand Circular
Channel Bandwidth:	27 MHz
Signal Power:	Japanese mainland: 45-54 dBW Okinawa and Ogasawara islands: 45 dBW nominal
TWTA Power:	100 watts
Capacity:	Two simultaneous color TV signals

Spacecraft

Satellite Type:	Toshiba/General Electric zero momentum three-axis stabilized
Dimensions:	Box type: 1.2m x 1.32m x 2.89m
Weight:	670 kg at launch
Electrical Power:	900 watts at end of life
Telemetry Beacon(s):	11.70299 GHz 2.27699 GHz



BS-2A & BS-2B Satellite Footprint

First Contour:	**0.7 m dish**
Second Contour:	**0.9 m dish**
Third Contour:	**1.0 m dish**
Fourth Contour:	**1.2 m dish**
Fifth Contour:	**1.6 m dish**
Sixth Contour:	**2.0 m dish**
Seventh Contour:	**2.5 m dish**

Far Eastern Launch Schedules

Date	Satellite Name	Country/Entity	Orbit/L. Vehicle	Frequency Band(s)
Mid 1987	Engineering Test Satellite ETS-V	Japan/NASDA	150° E/NASDA H1	L-/C-band MSS
Mid 1987	Palapa B3	Indonesia	113° E/NASA Delta Rocket	C-band domestic
Early 1988	CS-3A	Japan	130° E/NASDA H1	C/Ka-band domestic
Early 1988	STC-1	U.S./Dominion	119° W/Long March	Ku-band DBS satellite
Mid 1988	CS-3B	Japan	130° E/NASDA H1	C/Ka-band domestic
Late 1988	Terasat 1	U.S./Terasat	TBD/Long March	C-band satellite
Mid 1989	GMS-4	Japan	TBD/NASDA H1	L-band Weather satellite
	Westar VIS	U.S./WU	91° W/Long March	C-band domestic
	Pacific Star 1	U.S./Pan Am Pacific	TBD/Long March	C-band regional
Mid 1990	BS-3A	Japan/NHK	110° E/NASDA H1	DBS Ku-band
Early 1991	Earth Resources Satellite ERS-1	Japan	TBD/NASDA H1	
Early 1992	Engineering Test Satellite ETS-VI	Japan/NASDA	150° E/NASDA H2	L-/C-band MSS

TBD = To Be Determined
MSS = Mobile Satellite Service

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Pacific Basin Satellites

Several major U.S. corporations plan to launch international satellite services for the Pacific Ocean region, including:

Columbia Communications Corp. (U.S.), 165 Degrees West

On December 4 1986, Columbia Communications Corporation, a wholly-owned subsidiary of Columbia Astronautics Corporation, was granted conditional permission by the Federal Communications Commission to construct, launch and operate an international trans-Pacific satellite system. Columbia's Pacific Satellite System will provide satellite communication services between western portions of the contiguous U.S., Alaska, Hawaii, Canada and Japan. It is anticipated that the bulk of the traffic to be carried by the Columbia satellite system will be video, voice and high speed data services for customers like the major stock exchanges, international banks and other financial institutions and service companies, as well as multinational corporations and trade institutions.

The Columbia Ku-band satellite system will consist of one operational satellite to be stationed at 165° west longitude and one ground spare. The proposed Columbian satellite will carry 44 transponders and will be based on the Hughes Aircraft HS 393 bus design. Of the 44 available transponders, thirty-six will have a bandwidth of 36 MHz while eight will have a bandwidth of 54 MHz. Columbia intends to market its satellite capacity on a non-common carrier, sale or long-term lease basis both for American and foreign customers. Any telecommunications services transmitted through the Columbia satellite system will not be interconnected with public switched message networks.

Finansat I & II (U.S.), 178 & 48 Degrees West

In January of 1986, the Financial Satellite Corporation was granted permission by the U.S. Federal Communications Commission to create an international satellite network consisting of two operational spacecraft covering the Atlantic and Pacific regions and one ground spare. Since the fledging international satellite operator will be competing directly with Intelsat for the emerging high speed business data market within the Pacific and Atlantic Ocean regions, Finansat will need to have its system successfully coordinated with the Intelsat organization. Finansat hopes to inaugurate its international financial telecommunications system before the end of the decade.

Designed to accomodate international financial telecommunications traffic between the various offices of multinational banking institutions, Finansat satellites will serve an extensive network of low-cost micro-earth stations located at customers' premises. These micro-earth stations will use .6 meter antennas capable of receiving telecommunications traffic at a data rate of 19.2 kb/s or 1.8 by 1.4 meter paraboloid dishes for transmission at a data rate of 1200 b/s and reception at 19.2 kb/s.

Depending on the users' requirements, the Finansat system can provide either multipoint, interactive or direct data communications. The Finansat satellites will relay the encoded transmissions of associated micro earth stations to a Finansat network control center (NCC). To connect the incoming signals to the intended recipient earth station, the NCC will select the appropriate transponder and channel for the retransmission. Those locations using earth stations with 10-meter aperture antennas will be able to bypass the NCC and directly link with other large-aperture stations at much higher data rates. Direct user-to-user networks could transmit up to 32 SCPC channels per transponder at a bit rate of 1.544 Mb/s or send a single data stream per transponder at 60 Mb/s.

Celestar I & Celestar II [U.S.], 170 and 70 Degrees East

On June 12 1986, McCaw Space Technologies Inc., a subsidiary of the Washington D.C. firm McCaw Communications Companies Inc., filed an application before the U.S. Federal Communications Commission for permission to construct, launch and operate the Celestar International Satellite System. The Celestar system will consist of two Ku-band satellites and one ground spare. Each Celestar Ku-band satellite will carry thirteen narrowly-focused spot beams with a diameter of approximately 400 miles and one wider "North American" beam with a diameter of approximately 1200 miles. An on-board switching matrix will allow any uplink channel in any beam to be connected to any downlink channel of any other beam. Located at 170° east longitude, Celestar I will be used to link North America, Hawaii and Guam with locations in Asia and the South Pacific. Located at 70° east longitude, Celestar II will link Guam with locations in Asia, Africa and Europe. Through the construction of a hub station on the island of Guam, McCaw intends to control both satellites as well as double hop traffic from one Celestar spacecraft to the other. If granted F.C.C. approval, McCaw will market international services on a selective, non-common carrier basis.